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Mathematics embraces the Planet in 2013

This year is the International Year of Mathematics of Planet Earth (MPE). The year is aimed at developing a broader understanding of mathematics and statistics while encouraging discussion and more research on how the discipline can help to address global challenges.

The Australian Mathematical Sciences Institute is teaming up with Geoscience Australia and others to spread the word about how mathematics can help understand and address global challenges. Geoscience Australia's Chief Scientist Dr Clinton Foster is a proud ambassador for this initiative to promote the essential role of mathematical sciences in society.

Not simply disciplines of their own, mathematics and statistics are essential components to many. The year aims to emphasise just how big a role the mathematical sciences play in our world.

The central event of the MPE program will be a conference in Melbourne from 8–12 July to bring together the entire scientific community to cultivate discussions and collaboration and draw on the mathematical sciences to solve challenges faced by our planet.

Sessions will support the MPE themes:

- A planet to discover
- A planet supporting life
- A planet organized by humans
- A planet at risk

Geoscience Australia is organising sessions on 'Mitigating Natural Disaster Risk' and 'Realising our Subsurface Potential'. Plenary speakers invited for these sessions are Dr Robert Muir-Wood from Risk Management Solutions (London) and Professor Brian Kennett from the Australian National University (ANU). Professor Malcolm Sambridge from ANU will give the public lecture that will touch on the contributions of mathematics to the MPE themes and also point to new horizons.

Related articles and websites

Register for the event
http://mathsofplanetearth.org.au/events/2013/

Dr Clinton Foster talks about Maths and Planet Earth
http://mathsofplanetearth.org.au/clinton_foster

For more information

email: ausgeomail.com.au

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2013 Acreage Release provides opportunities in underexplored regions

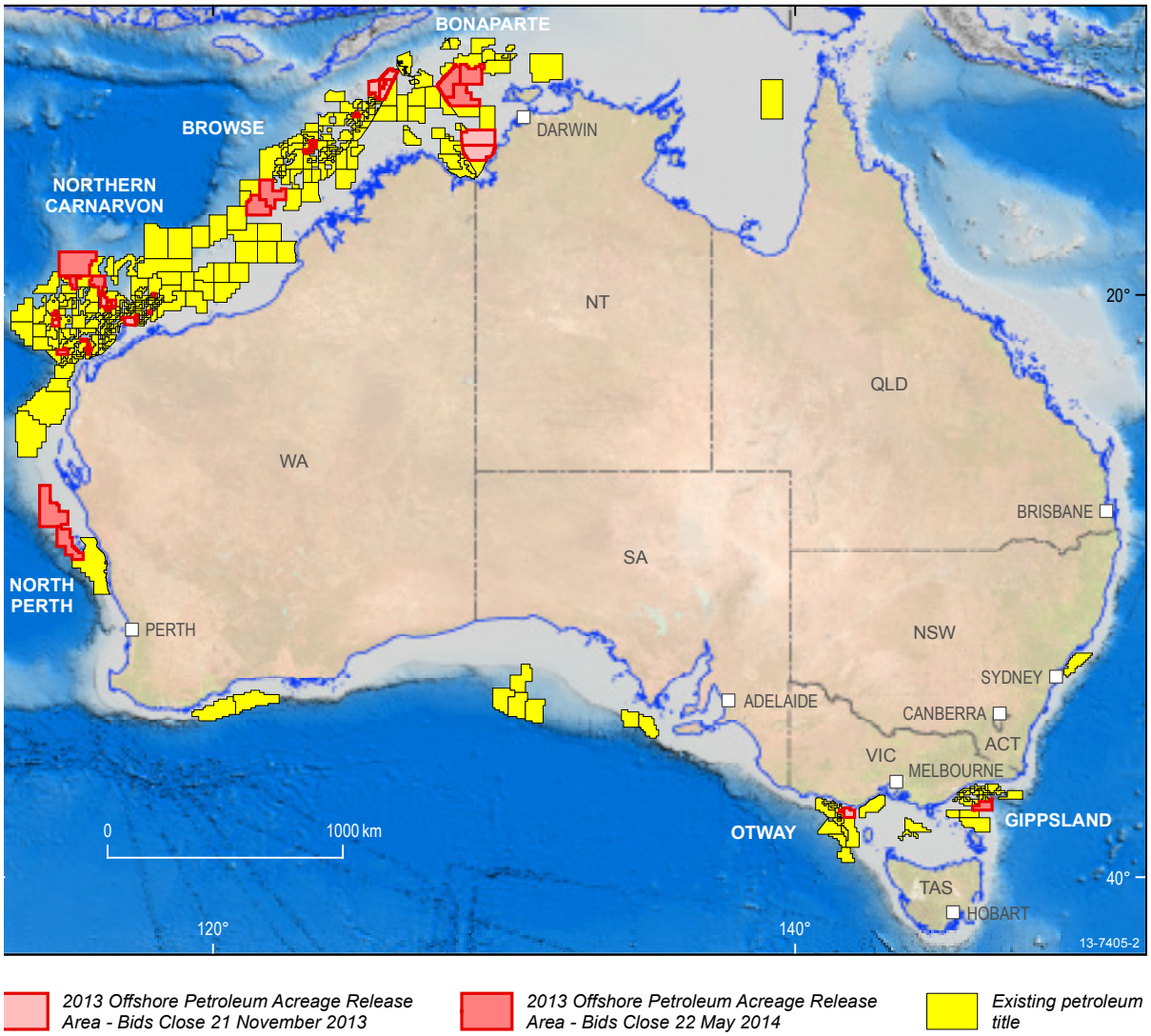

Figure 1: Offshore areas released for petroleum exploration as part of the 2013 acreage release

The Minister for Resources and Energy Gary Gray has released new offshore petroleum exploration areas at the annual Australian Petroleum Production and Exploration Association (APPEA) conference in Brisbane.

Minister Gray announced that 31 areas in 6 offshore basins would be available for petroleum exploration in Commonwealth waters off the Northern Territory, Western Australia and Victoria. Areas on the North West Shelf off Western Australia again feature prominently and also include the northern Bonaparte Basin.

Area sizes vary from 80 square kilometres to 134 668 square kilometres. The largest release areas are offshore from the Northern Territory and Western Australia in underexplored regions of the Browse Basin, the northern Exmouth Plateau and the offshore northern Perth Basin. Two areas in the Otway and Gippsland basins offshore from Victoria complete the 2013 Acreage Release.

The Australian Government's annual release of offshore petroleum exploration acreage encourages investment and provides open access to comprehensive pre-competitive geological and geophysical data gathered and collated by Geoscience Australia. This data helps industry to make informed investment decisions in relation to its exploration programs.

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Geoscience Australia's Dr Tom Bernecker, Senior Geoscientist and leader of the Acreage Release Project, said at the APPEA conference that this year's acreage release was again well supported by multiple industry nominations, signalling a sustained interest in exploring both mature and frontier regions.

"The 2013 Acreage Release also provides opportunities for exploration companies of all sizes in a range of shallow and deep water locations. Many areas are in already producing regions and close to existing infrastructure, while areas in underexplored regions present opportunities for applying innovative exploration concepts," Dr Bernecker said.

New data acquired in the northern Perth Basin as part of Geoscience Australia's recently completed Offshore Energy Security Program supports two key areas in this year's release. This data has been interpreted and integrated with existing datasets to provide a comprehensive assessment of the potential hydrocarbon prospectivity of this offshore frontier. Highlights of this work were presented by Dr Nadège Rollet and Dr Emma Grosjean at the APPEA conference.

Details of the 2013 release can be found on the Department of Resources, Energy and Tourism's Acreage Release website.

Related articles and websites

Offshore Petroleum Exploration Acreage Release
www.petroleum-acreage.gov.au/index.html

Minister Gray's media release
http://minister.ret.gov.au/MediaCentre/MediaReleases/Pages/acreage-release-announced.aspx

APPEA conference
www.appea.com.au

Offshore Energy Security Program
www.ga.gov.au/energy/energy-security-program/offshore-energy-security.html

For further information

email: ausgeomail.com.au

Promoting Australian mineral exploration investment opportunities in Canada

Figure 1: The *Australia Minerals* booth at PDAC2013

In March 2013 Geoscience Australia, together with senior representatives from the State and Northern Territory government geoscience agencies (the *Australia Minerals* team), attended the Prospectors and Developers Association of Canada's (PDAC) annual convention. The PDAC convention is the world's leading forum for investors, service providers and government agencies active in or associated with the global mineral exploration and mining industries. The convention was held in Toronto from 3–6 March and attracted over 30 000 Canadian and international delegates.

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The profile of *Australia Minerals* was lifted at PDAC 2013 with a new, professionally designed, custom booth and new branding (Figure 1), plus a mineral exploration investment seminar. One of over 600 booths in the Trade Show, the updated booth is more in line with Australia's leadership position in world mining and exploration. Feedback on the new booth was very positive.

In conjunction with Austrade, *Australia Minerals* also organised a mineral exploration investment seminar focussed on Australia's recent nickel, uranium and rare earth element discoveries in new mineral provinces, with presentations by Andy Barnicoat of Geoscience Australia and Australian exploration companies. The seminar also included a presentation by Ernst and Young on Australia as a low-risk mineral investment destination. The PDAC Technical Session on 'Australia's Au-Cu Deposits: Current Scene and Hidden Future', co-chaired by Rick Rogerson (Geological Survey of Western Australia), highlighted recent discoveries and involved Roger Skirrow from Geoscience Australia who presented on 'Australia's iron oxide Cu-Au provinces: world-class opportunities'.

Related articles and websites

Mineral Exploration Promotion Section
www.ga.gov.au/exploration-promotion

For further information

email: ausgeomail.com.au

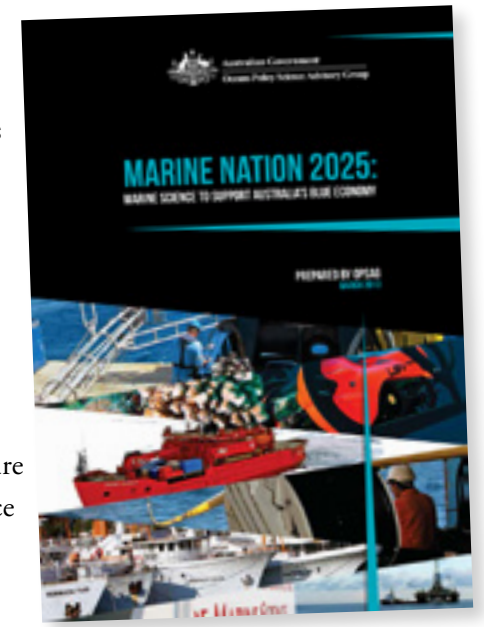
Working together for a marine nation

The importance of marine research to Australia's economy and to furthering our knowledge of Australia's vast marine jurisdiction was recently recognised with the release of the Australian Government's revised marine science framework, *Marine Nation 2025: Marine Science to Support Australia's Blue Economy.*

The Marine Nation 2025 framework report, prepared by the Oceans Policy Science Advisory Group, identifies the national challenges facing Australia and its marine estate, and outlines the opportunities for marine science to provide innovative solutions. It recognises strengths and weaknesses in marine research infrastructure and capability, recommends development of a 10-year marine science strategy and proposes the formation of a National Marine Science Advisory Committee.

Marine Nation 2025 outlines six interconnected grand challenges facing Australia's marine jurisdiction:

- Sovereignty, security, natural hazards
- Energy security
- Food security
- Biodiversity conservation and ecosystem health
- Dealing with changing climate
- Optimal resource allocation



Each of these grand challenges has a significant marine dimension with gaps in understanding or tools that can be addressed by marine science. To meet these challenges, *Marine Nation 2025* outlines a case for future investment in the three traditional pillars of

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science: observation, experimentation and modelling. The report also recognises that investment in science communication is needed to improve application and acceptance of science in policy, legislation and regulation.

Marine science cuts across many disciplines, and involves a range of government, university and research institutions. The Oceans Policy Science Advisory Group is as an advisory body comprising the leaders of Australian marine science organisations involved in marine research and providing information to support the management of Australia's marine domain. It is currently chaired by the CEO of the Australian Institute of Marine Science, Mr John Gunn.

Geoscience Australia contributed to development of *Marine Nation 2025*, in particular in relation to advice on territorial boundaries, marine planning, biodiversity conservation, natural hazards management, energy security and climate change adaptation measures. Our agency will continue to participate in the Oceans Policy Science Advisory Group and assist in the implementation of the revised framework.

Related articles and websites

Oceans Science Policy Science Advisory Group
www.aims.gov.au/opsag

For more information

email ausgeomail@ga.gov.au

Best practice science is open and transparent

Dr Clinton Foster, Chief Scientist, Geoscience Australia.
This article was first published as a Conscience piece in the June 2013 edition of Australasian Science.

We take for granted science outcomes like the GPS navigation functions in our smart phones, although few of us understand the science behind it. Science underpins everything we do in our modern society and yet the numbers studying science in schools, and in some disciplines at universities, are continuing to fall in Australia.

Science information is literally available on tap via the internet—but provides answers that are often many and sometimes contradictory. These may be without supporting evidence and untested, and are what I call 'assertive science'.

The past century has been an age of assertive science in which the title 'scientist', a white lab coat and the use of jargon allowed assertions to be made, sometimes with dire consequences. In public, an assertive statement or the phrase 'trust me I am a scientist' was commonly offered in support of a conclusion. Often they were made by an individual scientist presenting answers produced by a single research agency. That type of assertive science should, quite rightly, be unacceptable. But, paradoxically, it has persevered in our age of easy and rapid access to information.

There are two key issues: firstly, recognition that science actually underpins everything we do, and, secondly, what is the evidence base supporting a particular conclusion. Both are often overlooked. Current assertive science is often without evidence, yet its outcomes or answers may be widely accepted in public.

There is a temporal symmetry to this type of science, both based on data access: too little data (20th century) and too much untested data (21st century). In both cases there is a lack of understanding or explanation of processes undertaken to gather the available data.

The scientific method is based on the principle of testing ideas or hypotheses, through rigorous observing, recording, and repeated testing of data, understanding its limitations, and by allowing the processes, findings and data to be independently reviewed. The

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caveat is that it is to the best of our current knowledge, and that research is ever ongoing to discover and understand the unknown.

In the tsunami of information available on any topic, researchers and the public need to be confident that conclusions used to inform community decisions are based on the best available data, and that concepts and results are tested and accessible to interested persons or groups. There is an Australian Code for the Responsible Conduct of Research, and it is within that context that Geoscience Australia has reaffirmed its principles for research activities.

The six principles are embedded in Geoscience Australia's long term strategic planning and day-to- day operations. They reflect the fact that our reputation for providing timely, relevant, accurate and trusted technical advice on geoscience and spatial matters that affect the nation is highly valued.

As science is the fundamental tool of the agency, we recognise that our science outputs must be evidence-based, testable and transparent. It is essential that these outputs are peer reviewed, communicated effectively, and our science programs are benchmarked and monitored to ensure sustainable capability. This also requires a collaborative and cooperative approach within the agency, with external stakeholders, and with other science agencies. Collaborative science is essential because of the complexity and interrelationship of parameters that must be considered to assess issues such as the impact of natural hazards on communities.

Data custodianship and access is also a key priority to ensure that the best geological and spatial data sets are acquired, maintained and made available to all interested stakeholders, and particularly collaborative science agencies.

We are confident that these principles provide a solid foundation for our continued contribution to Australia's future well-being through the delivery of quality geoscience and spatial data and information.

The Science Principles document is available as a free download from the Geoscience Australia website.

Related articles and websites

Geoscience Australia Science Principles
www.ga.gov.au/about-us/corporate-documents/science-principles.html

Australasian Science
www.australasianscience.com.au

For more information

email: ausgeomail.com.au

Government geoscience enters new phase in the search for oil and gas

Marita Bradshaw, Senior Science Advisor, Geoscience Australia.
Article first appeared in PESA News Resources, June-July edition, Issue No. 124.

From colonial times, government geoscience has played a key role in revealing the resource endowment of Australia, even when geology itself was a young science. Today that work continues and one of the roles of Geoscience Australia is to build the national geological framework to assist petroleum and mineral exploration. As an agency within the Australian Government's Resources, Energy and Tourism portfolio, Geoscience Australia works closely with the State and Territory government geoscience agencies and with industry to achieve a national understanding of Australia's resources.

The announcement in November 2012 of additional on-going funding to Geoscience Australia will augment the provision of pre-competitive data that industry uses to discover and develop Australia's energy and mineral resources. Over the past few months the proposed components of Geoscience Australia's new and expanded petroleum program

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have been discussed with exploration companies, continuing the long partnership between government geoscience and industry. The new funding will enable Geoscience Australia to undertake a strategic analysis of the petroleum potential of both onshore and offshore Australia leading to new exploration opportunities and discoveries.

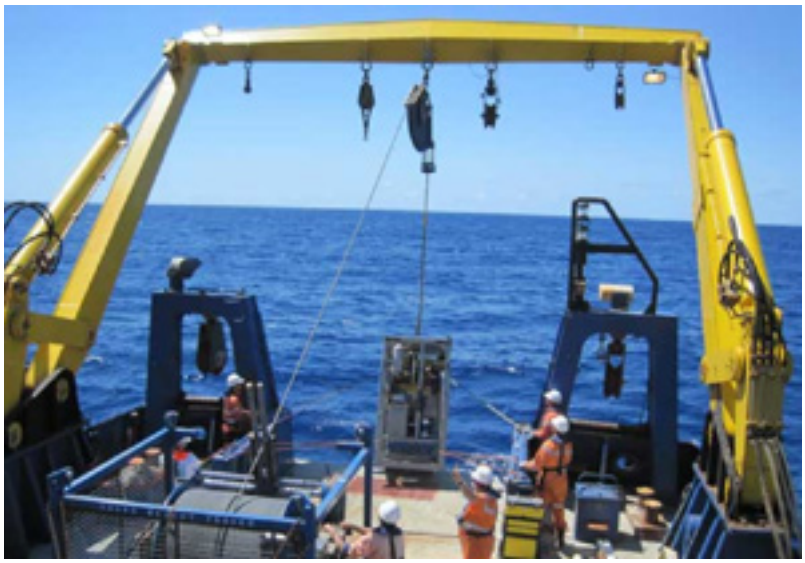

Figure 1: Crew aboard the RV *Southern Surveyor* deploy equipment during a hydrocarbon seepage survey of the northern Perth basin.

Geoscience Australia and its predecessors, the Bureau of Mineral Resources (BMR) and the Australian Geological Survey Organisation (AGSO), have been in the business of providing fundamental geoscience to underpin the search for hydrocarbons in Australia for over 60 years. The BMR was established in 1946 to acquire the fundamental data sets to reveal the resource endowment of the continent. Both geological mapping and geophysical surveys were part of the mix from the beginning. Australia's first seismic survey was undertaken by BMR around Roma, Queensland, in 1949–50 and early mapping in the Carnarvon Basin directed Ampol to the Exmouth Gulf region and the first oil discovery at Rough Range in 1953. An effective partnership between government geoscience and industry continued with the introduction of the *Petroleum Search Subsidy Act* in 1957 and deepened further once the Australian Petroleum Production and Exploration Association (APPEA) (or APEA as it was then) came on to the scene in 1959.

The onshore basins were the initial focus of the search for oil and gas by both industry and BMR. There was a shift offshore with the discovery of the giant oil fields in the Gippsland Basin, underlying Bass Strait, in the 1960s and BMR's continental margins surveys during 1972–73. This program systematically surveyed Australia's offshore areas using several different seismic vessels and so mapped the basin framework revealing areas of thick sedimentary section on the western, southern and eastern margins. From 1985 to 1998 the BMR's *Continental Margins Program* contracted the research vessel the *Rig Seismic* to map and sample the offshore to assess petroleum prospectivity and to start to build the database to define Australia's marine jurisdiction.

Government geoscience subsequently underpinned Australia's submission for areas of extended continental shelf to the United Nation's Commission on the Limits of the Continental Shelf (CLCS). In 2008 the Commission adopted recommendations that confirmed Australia's jurisdiction over an additional 2.5 million square kilometres, including some areas with petroleum potential.

Major pre-competitive programs of seismic data acquisition and dredging in offshore frontier basins were undertaken by Geoscience Australia during the 2000s. New data changed perceptions and exploration was encouraged into the Bremer, Ceduna and Duntroon sub-basins of the Bight Basin on the southern margin, and into the offshore northern Perth Basin on the southwest margin. Today more than 90 per cent of Australia's identified conventional oil and gas resources have been discovered in offshore Mesozoic marginal basins.

Results of pre-competitive program undertaken as part of the Offshore Security Program (2006–2011) will also be presented at the 2013 APPEA conference, including studies of the offshore northern Perth Basin in support of the annual offshore petroleum acreage release. Some of Australia's oldest petroleum systems will also be discussed, as the petroleum

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potential of the onshore basins is reconsidered.

However a new balance is now being struck with a pivot back to the onshore as the importance of coal seam gas (CSG), shale gas and tight oil and gas grows. The coming of age of the CSG industry in Australia and the 'shale gale' in North America has prompted a reconsideration of the petroleum potential of Australia's onshore basins. From 2010 to 2012 there has been a near doubling of the onshore basin area under exploration license and several major international companies have joined local explorers in their endeavours to unlock the potential of Australian Paleozoic and Proterozoic petroleum systems. The data holdings and previous studies of government geoscience agencies, including detailed geochemical analyses undertaken by Geoscience Australia, provide a knowledge store to support this new phase of onshore exploration.

The major increase in Geoscience Australia's funding enables the continuing story of government geoscience for hydrocarbon discoveries. Geoscience Australia has recently received additional on-going funding of $40 million per year ($34 million in 2013–14) to enable provision of pre-competitive data to help secure Australia's future energy and mineral resource needs. This funding will also deliver enhanced data stewardship and the continuation of vital services for geoscience monitoring and advice. This significant reinvestment will mean Geoscience Australia can, in effect, deliver a new prospectus for the nation's hydrocarbon resources, which will support the continued growth of onshore exploration and drive offshore petroleum acreage release.

Components of the new program will include whole-of-margin and national studies to address fundamental issues affecting prospectivity, plus the acquisition of new data and geological studies in areas adjacent to proven basins, and in poorly understood and remote frontiers. Petroleum systems, palaeogeography, and onshore source rock studies will be a particular focus; and there are plans to undertake a major tectonic and structural study of the western and north-western margins. Data custodianship is a key priority of the new program to ensure that geological and geospatial information is captured and made freely available to industry, government, academia and the public.

Details of the new future program are currently being developed. Geoscience Australia's CEO Dr Chris Pigram provided an update on the future program as a keynote presentation at APPEA's annual conference in Brisbane.

For more information

ausgeomail.com.au

The new funding enables Geoscience Australia to continue to build the fundamental datasets and undertake the geological framework studies that will help to reveal Australia's petroleum endowment. The new program has a long-term focus, with pre-competitive data acquisition campaigns both onshore and offshore, as well as new scientific studies.

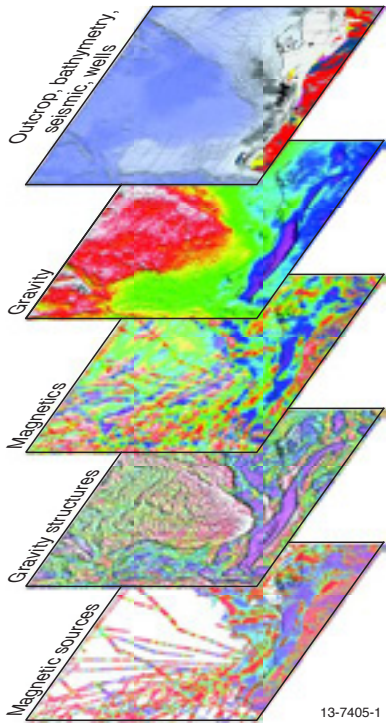

Figure 2: Series of datasets obtained during the South-west Margin Project completed under the Australian Government's Offshore Energy Security Program (2006–2011).

Related articles and websites

PESA News

www.pnronline.com.au/article.php/200/2350

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Geoscience Australia support for AusAID's mining for development initiative

Humanitarian aid programs supporting basic health, education, and disaster response initiatives are often the public face of efforts by the Australian Agency for International Development (AusAID). However, initiatives to support economic development in partner countries are also an important objective and AusAID is diversifying its approach to economic development and poverty reduction through the Mining for Development (M4D) Initiative. The details of this assistance initiative were announced by the former Prime Minister, the Hon. Julia Gillard MP, in October 2011. The AusAID M4D Initiative encompasses development assistance in the areas of economic policy and legislative development, governance and regulatory frameworks, revenue transparency, community engagement, and improving geoscientific information to enhance sustainable management of the mining sector. Geoscience Australia has been contracted to scope a three-year program designed to assist developing countries to sustainably develop their mining sectors through improved geoscientific information delivery.

The importance of geoscience information in an aid context

Geoscience information underpins the sustainable development of mineral resources. Stimulating sustainable resource development and wealth for both communities and governments can contribute to economic growth and poverty reduction within developing countries. One way to achieve this is through the acquisition, management, interpretation, and dissemination of pre-competitive geoscience data. The presence of skilled geoscience professionals, knowledge and data about national mining potential and strong geoscience management arrangements improves the ability of countries to attract and regulate mining exploration and investment in a sustainable manner and allows for long-term economic, physical, and social planning. Governments with good geological information are also better placed to negotiate with mining companies—this can result in higher royalty payments, improve local participation and increase investments in shared infrastructure.

Geoscience Australia's role in M4D

The role of Geoscience Australia, in conjunction with the State-Territory geological surveys in the successful development of the Australian minerals industry is a key reason why Geoscience Australia has been contracted by AusAID to conduct the current scoping program. The Geoscience Australia-led M4D Geoscience Information Strengthening project has scoped the feasibility and demand for engagement by partner countries in a longer term three-year capacity building project.

Major outputs to assist developing countries

To date Geoscience Australia has completed the 'Assessment of Mineral Potential, Geoscience Survey Capacity, Risk, and Geological Aid in Africa, Asia, Latin America, and the Pacific' report which was formally released by Minister Gary Gray on 23 May 2013. The report provides a baseline assessment of the mining sector in assessed countries, and provides the regional context within which M4D will ultimately operate. In this report, the mineral sector potential of 138 developing countries was assessed using four broad categories: geological potential and existing resource sector, geoscience survey capacity, socio-political risk, and the degree of geological assistance the countries have, or are currently receiving. The report breaks down the assessments into four broad geographical regions, with each region's data being displayed graphically (Figure 1).

Data displayed in the report are from a mixture of commercially provided, published and unpublished sources. Where data have been generated specifically for this report, full methodologies, and the limitations of those methods, are described.

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Figure 1. Overview of the status of known mineral resources and the minerals industries of the Latin American region. The figure shows two of the assessments in the Mineral Potential and Mineral Resources chapter. The known mineral resource assessment informs readers about how many well-known deposits of minerals ('resources') there are in any given country, while the existing mining industry assessment uses world production rankings to indicate how much existing mines are currently producing . See the full report for a detailed methodology. The categorised assessment approach used in all of the assessments facilitates easy observations: in this figure the maturity of the mining sector in Brazil is evident, with both very large known mineral resources and a very large existing mining industry (e.g., primarily iron ore).

In addition to this report, a series of in-depth information briefings has also been completed for countries and territories identified as potential assistance recipients. Detailed briefings have been prepared for: Afghanistan, Bougainville, Ghana, Indonesia, Liberia, Myanmar, Papua New Guinea, the Solomon Islands, South Sudan, Sri Lanka, and Zambia. These reports provide an assessment of the geology, mineral resources, exploration opportunities, mineral production, mining sector institutional capacity (legislation, economics, sectoral constraints, etc), and the general geoscientific capacity of the current government geological survey and Ministry of Mines.

An important milestone in the M4D scoping process was to conduct in-country scoping missions to:

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- test if demand for an activity to improve the quality of available geological information is present
- explore possible areas of collaboration between the Survey's and other agencies
- understand the policy environment, and inform Geoscience Australia's program design.

Scoping missions to Indonesia and Papua New Guinea were undertaken in December 2012 and April 2013, respectively. These missions allowed Geoscience Australia staff to meet potential partner agencies and others in the mining sector to obtain a better understanding on whether assistance under the M4D Initiative would be beneficial, and where that assistance would be best targeted to have the most sustainable and far-reaching impact. Particular care was taken during scoping missions to engage with a range of government agencies, industry representatives, and possible assistance delivery partners to assure an informed view of assistance that might be considered.

The findings from these scoping missions and the earlier desk-based research are currently being used to produce a full program design which was submitted to AusAID for consideration in May 2013.

For more information

email: ausgeomail@ga.gov.au

Related articles and websites

Assessment of Mineral Potential, Geoscience Survey Capacity, Risk, and Geological Aid in Africa, Asia, Latin America, and the Pacific

www.ga.gov.au/metadata-gateway/metadata/record/gcat_74580/